Geology and Geochemistry

of the Fenton Creek Zone

(MANITOBA, CANADA)

by

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Abstract

The Fenton Creek deposit is a new Zn-Cu base metal discovery situated 70km southeast of the town of Snow Lake, which hosts numerous polymetallic Zn-Cu and Cu-Zn volcanic hosted massive sulphide (VHMS) deposits. The Fenton Creek deposit was located using airborne EM and MAG techniques and is completely blind with no surface expression as it is overlain by 30m of Paleozoic limestone and dolomite and 20m of muskeg. Diamond drilling has defined an initial geologic resource of 2.3 Mt grading 0.09g/t Au, 20.42g/t Ag, 0.56% Cu and 7.44%Zn.

The deposit consists of two massive sulphide lenses hosted within a mixed sequence of graphitic metasediment and volcaniclastics. Amphibolite grade metamorphism has destroyed most of the primary features in the host rocks and caused a complete recrystallisation and coarsening of the ore. The footwall to the deposit is a quartz-muscovite-sillimanite schist of rhyolitic composition. The immediate hanging wall contains biotite-clinopyroxene-plagioclase schist and amphibole-plagioclase schist of basaltic composition, which is overlain by a substantial thickness of quartz-biotite-sillimanite schist of rhyodacitc composition. The ore position is marked by metasediments including garnetifferous and graphitic metapelite. Analysis of the carbon isotopes from the graphite suggests that the source of the carbon is biogenic, which indicates a seafloor position.

Unlike many of the known and well studied VHMS deposits in the Snow Lake Assemblage which have discordant pipe-like hydrothermal alteration with sericitized peripheries and chloritized cores, the hydrothermal alteration in the Fenton Creek stratigraphy consists of fault related K-feldspar-muscovite (formerly quartz-sericite alteration) that occurs in and around the fault zones and stratiform K-feldspar, muscovite, sillimanite, cordierite and cummingtonite (formerly sericite +/- chlorite alteration) confined to the footwall. The footwall alteration is fairly weak consistent with that found in a stratiform/blanket-like volcanic hosted massive sulphide system. Mass balance calculations indicate that the footwall alteration reflects an overall loss in Si, Al and Na with only minor gains in Ca and Mg.

The ore lenses comprising the Fenton Creek zone contain three different types of mineralisation that include disseminated, semi-massive and massive styles. The massive and semi-massive mineralisation consist of pyrrhotite +/- sphalerite-chalcopyrite while the disseminated mineralisation can be divided into three types of mineral associations (A) Pyrrhotite +/- chalcopyrite-sphalerite, (B) Pyrrhotite +/- galena-chalcopyrite-tetrahedrite (C) Pyrrhotite +/- graphite-chalcopyrite-sphalerite. Spatially type B disseminated mineralized rock is observed proximal to the semi-massive and massive mineralisation while type A and C were observed both in and proximal to the semi-massive and massive styles of mineralisation. Metal zonation studies of section 400N suggest that Zn and Cu dominate the upper lens whereas; the lower lens contains Pb, Ag, and Au. Plotting of the Zn ratio and the Cu ratio indicate the hottest portions of the ore lenses exist down plunge from the thickest portion of massive sulphide intersected.

Geologic features including the arc-rift related basaltic volcanic/volcaniclastic rocks in the immediate hanging wall, overlain by large thicknesses of rhyodacitic volcaniclastics and biogenic carbon in the graphite of the Fenton Creek zone suggest that it may have formed in rift environment as a seafloor/sub-seafloor volcanic hosted massive sulphide deposit. This style of deposit may represent a new and previously unexplored mineralized stratigraphic position within the Snow Lake Assemblage.

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